

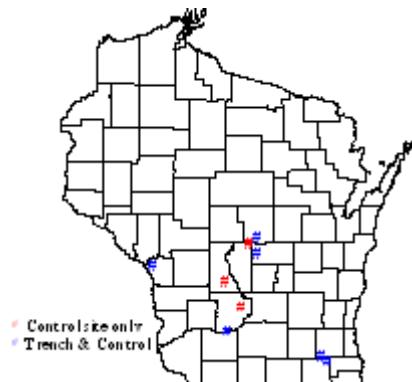
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Update on Red Pine Pocket Mortality Projects

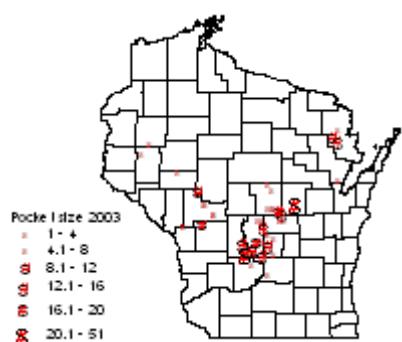
By Sally Dahir

This year, progress was made on several fronts in studying red pine pocket mortality in Wisconsin. These included:

1. The initiation of a National Science Foundation (NSF) project coordinated by Prof. Ken Raffa of the Department of Forest Entomology, University of Wisconsin, Madison in collaboration with the Dept of Natural Resources Forest Health Section, and several experts from around the country
2. The second year of a project conducted by DNR forest health staff mapping pocket expansion over time and investigating possible relationships between time of thinning and populations of bark beetles
3. A DNA analysis of *Leptographium* species conducted by Dr. Glen Stanosz of the University of Wisconsin, Madison.



In the first year of the NSF project, several sites were delineated for a root trenching trial (map on right). There are 6 sites (blue dots) where both a trenched pocket (roots severed along the outside perimeter of dead trees) and an untrenched control pocket were established. In addition, 3 sites (red dots) will serve as controls only: either in untrenched symptomatic pockets or asymptomatic stands. Trenching was done in late April of 2004. At the same time, trees within and around the pockets were tagged, their crowns rated and insect traps set up. These traps were then monitored throughout the summer for several species of bark and root beetles.



In 2003, the first year of a project by Forest Health staff to monitor rates of pocket expansion, c. 123 pockets in over 50 stands were mapped (map on left). The center of each pocket was located

with GPS and each tree was accurately mapped using a rangefinder. Symptomatic trees were then rated as to disease severity and the presence or absence of turpentine beetle pitch tubes. These pockets were revisited in the summer of 2004. New symptomatic trees were noted as was the presence of new pitch tubes. In conjunction with this project, turpentine beetle traps were set up in 2 groups of thinned stands. The first group had been thinned in the summer of 2003 and the second group in February through May of 2004. Traps were set up in early May 2004 but few turpentine beetles were caught. This may have been due to a 6 day period of extremely warm temperatures in mid-April (between 15 and 25 degrees (F) above normal in much of the state), which may have caused the flight season to occur in April before traps were set.

An analysis of the symptomatic tree data from both 2003 and 2004 reveal 2 important relationships. First, the number of recently dead trees (annual mortality) was positively correlated with pocket size (i.e. the total number of dead trees) for both 2003 and 2004. This relationship was stronger in 2003 ($p < 0.0001$) but still significant in 2004 ($p = 0.035$). The r-squared value was very low for both suggesting that the rate of pocket growth is due to many other factors than just original pocket size. Since the pockets were first mapped in 2003, all trees that had died recently (branches with fine twigs and needles) were considered to have died between the fall of 2002 and the summer of 2003. There were far fewer recently dead trees in 2004, only 85 compared to 261 in 2003, and 30% fewer asymptomatic trees with turpentine beetle pitch tubes (117 in 2003 and 79 in 2004). However, there was a significant positive relationship between the number of healthy trees with pitch tubes and both pocket size and annual mortality in 2004 ($p=0.01$ and $p=0.046$, respectively) and 2003 ($p=0.01$ and $p=0.014$, respectively).

These data suggest that the factors which lead to tree mortality in these pockets either become better established as pockets expand and/or the greater stress on healthy trees in large pockets is an increased attractant to root and bark insects. The fact that pocket expansion seemed to slow in 2004 may be due to weather. Spring and summer weather was wetter and cooler than normal, more stressful on insects and less stressful on healthy red pine. In addition, the winter of 2004 was more normal in terms of minimum temperatures and snowfall. For instance, January 2004 was far colder than the previous 10 years, with average minimum temperatures ranging from 6-10 degrees below the 10-year normal in the north to 2-5 degrees below in southern and central Wisconsin. This was much closer to our normal winter weather. The cold weather may have had a dampening effect on over-wintering populations of turpentine beetle (*Dendroctonus valens*).

The third project involves the DNA analysis of fungal species involved in pocket expansion. Isolates of possible *Leptographium* fungus pathogens have been obtained from numerous collections of red pine bark and wood supplied by DNR Forest Health specialists. These fungi are being compared with known isolates from culture collections and other researchers around the US. Because morphological characteristics of these fungi can be variable and overlap (making identification difficult), DNA of these fungi is being studied. Particular differences in DNA sequence can provide "markers" for rapid and unambiguous identification of different fungal species. It is hoped that discovery of specific markers will allow clarification of the frequency and abundance of the various *Leptographium* species associated with dying red pines, and help to explain the initiation, distribution, and rate of expansion of red pine pocket mortality in Wisconsin.